SWAMP Meeting Summary

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The April 3 - 4 SWAMP (Science Working Group AM Platform) Meeting was co-chaired by Yoram Kaufman, EOS AM-1 project scientist, and Francesco Bordi, EOS AM system scientist. Bordi presented the agenda for the meeting (the agenda and all attachments for this meeting are available on the Web at http://modarch.gsfc.nasa.gov/SWAMP) and introduced first speaker.

EOS Project Status Report

Kevin Grady, {title?}, gave a brief overview of recent EOS AM-1 accomplishments. Grady congratulated the ASTER and CERES instrument teams for delivering their instruments on time—both instruments are at Valley Forge and both have undergone acceptance testing. He noted that CERES has already been integrated onto the spacecraft. The MODIS and MOPITT instruments are now assembled and are currently undergoing environmental testing. MISR assembly is nearing completion, but that team is having to correct some problems with the electronics. Overall, Grady stated that all five of the EOS instruments are in good shape.

He reported that much progress is being made on spacecraft integration. The power and C&DH {define acronym?} subsystems have been integrated, the ground support equipment has been configured for spacecraft level testing, 98% of the spacecraft boxes have been fabricated, and the solar array is now proceeding through environmental tests. According to Grady, the solar array's harmonic drive failed its life test, so the EOS Project Office is having three new units built and accelerated life tests will be run on these to determine of the problem was corrected. He also noted that the onboard solid state recorder had a few problems, making it and the solar array drive his current top two concerns. Grady listed his remaining top ten concerns.

Kaufman asked if there are any issues that will continue to be risks on orbit. Grady responded that the solar array harmonic drive may still be a risk after launch as it failed its life test. However, he feels that the problem has been corrected and pointed out that the newly-built drives will undergo 50x life tests. He added that the solar array problem is not a threat to the spacecraft integration and testing schedule.

Kaufman asked if there are any new plans for the EOS AM-2 platform. Grady responded that after EOS PM-1, the EOS platforms move to 6-year launch centers. Otherwise, platform flight configurations and payloads are still under consideration by the EOS Project Office.

Grady stated that near term plans include the delivery of MISR, MODIS, and MOPITT to Valley Forge and completion of bench acceptance tests for all three. Also, delivery of the remaining spacecraft components—such as the S-band transponder and band equipment modules—are coming due. He hopes to complete the second spacecraft end-to-end test soon with the control center. Meanwhile, the launch vehicle (an ATLAS IIAS) is nearing completion and will be delivered to the launch site {when??}.

Grady pointed out that 12 months from now, the fully-integrated EOS AM-1 spacecraft is due to be at Vandenberg Air Force Base. Yet, MISR, MODIS, and MOPITT will probably arrive only 1 month before launch, which greatly compresses Valley Forge's integration and testing schedule and introduces risk. The team at Valley Forge will need the instrument team's full support during that time.

Grady displayed a copy of the new EOS AM-1 logo.

EOS Instrument Team Reports

Robert Murphy, MODIS project scientist, gave a brief status report. He announced that MODIS is currently undergoing thermal vacuum testing and things are going well with the instrument, despite leaking problems with the chamber. Murphy noted that the sensor's nominal on-orbit temperature will be 10K lower than was expected. However, the sensor is working well and all major performance issues have been resolved. These include: low sensor background; useful SWIR behavior; reduced cross-talk; demonstration of the SRCA working as expected to provide useful spectral, spatial, and radiometric data; and virtually all signal-to-noise and dynamic range is within specifications.

Version 1 software testing is underway at the GSFC DAAC and is going smoothly. Specifically, software to generate forty-six Version 1 MODIS products has been delivered by the Science Team—the remaining four products are expected this month. Integration and test activities on the Version 1 software using the pre-Release B testbed begins in May 1997 at three different DAACs {is this correct?}. Murphy also presented a timeline for delivery and testing of Version 2 software. Testing in the team leader computing facility will be conducted from May to October 1997, and testing at the DAACs will be from February to March 1998.

Murphy noted some issues that may impact MODIS software development and testing. For instance, any changes in metadata and toolkits could cause slips in the schedule. Also, it is unclear how or if the ECS Scheduler knows when a complete set of input granules is available for a PGE to process.

Dave Diner, MISR team leader, gave status reports on MISR and AirMISR. Thermal vacuum testing was completed on MISR in December 1996. These

tests were successful in verifying the instrument's thermal design. Some problems were identified in the camera power distribution system, leading to redesign and modification of that subsystem.

Diner's top four engineering concerns facing MISR are: 1) synchronization between data packet headers and contents; 2) intermittent data corruptions—there were "glitches" in the data about 10 percent of the time, but Diner thinks this problem is now resolved; 3) intermittent failures when beginning to send high rate data—again, modifications were made and the problem is not recurring; and 4) flight computer shutdown problems—this problem has not been observed since the power system modifications were implemented.

Diner reported that the flight system was successfully retested at ambient temperatures and that the second thermal vacuum test is planned for later this month. On March 29, a "MISRman" test was performed, which involved suspending a 10' tall picture of a man above the instrument and then "viewing" it with MISR. Diner showed the resulting image—the first actual image data taken by the instrument.

Diner told the group that end-to-end tests of the PGE-1 (Product Generation Executables), which is Level 1 processing of the Level 0 data packets, is complete. This test was done by using Landsat Thematic Mapper (TM) data that was reverse processed back into the characteristics that will from data packets from MISR and put through Level 1 processing. These data will be registered in oblique mercatur projection. He showed a sample image taken from TM over a very mountainous region in Mexico and pointed out that some data couldn't be seen due to the angle of the camera (MISR's most obliquely angled camera was simulated), so those pixels were flagged and appear as black, or "obstructed."

On the AirMISR instrument, Diner reported that the camera has been radiometrically, geometrically, and spectrally calibrated. The ground data team is now in place for that instrument. He showed some sample AirMISR images.

Diner's top 5 concerns are: 1) the scheduled completion and testing of the MISR instrument; 2) there is no identified funding for instrument engineering support during the mission—originally, the plan was to fund engineering support through the EOS AM-2 timeframe; 3) reduction in planned science carry-over at the end of FY97 adds risk to FY98. Diner pointed out that the MISR science team ran out of funds in December 1996 because the new funds were not available to the team until 18 weeks into the fiscal year. He stated that, as a result of the funding delay, MISR's carry forward funds were cut down to 7 or 8 weeks and unless some measures are taken to prevent another delay this year, the MISR team may temporarily be "shut down." 4) The MISR science software development schedule is tight, so

MISR may not be able to accommodate any scope changes until after launch, which may affect the FPAR product that was recommended by the ATBD review board. 5) The availability of EOSDIS at launch is a concern. Diner noted that the emergency plan allows for the processing of only 1 - 2 orbits per week.

Bruce Barkstrom, CERES principal investigator, reported that CERES was delivered to TRMM early last year. The instrument passed thermal vacuum, calibration, and shipment readiness review tests. Regarding algorithm development, everything is going smoothly and on schedule. He pointed out that CERES algorithms were designed to handle multiple instruments on multiple spacecrafts, so the same CERES code applies to EOS AM-1 as it does to TRMM. However, the shift in computing environments is a concern. He feels that on AM-1 the automated environment may not operate the shell scripts as well as on TRMM, so there may be some discontinuities between TRMM backups and AM-1.

Barkstrom announced that within the next month simulation tests on the TRMM spacecraft will be conducted with the instruments onboard. Commands will be fed through the instruments and feedback will be received at NASA LaRC. These simulation tests will be evaluated within a month after that.

Barkstrom stated emphatically that the CERES team continues to need a spacecraft pitch maneuver to view deep space—he proffered that the maneuver is "critical." His two other main concerns currently are EOSDIS and validation planning.

Scott Lambros, {title?, Code ???}, delivered a status report on ASTER. He reported that the instrument was successfully delivered to Valley Forge and it has successfully undergone bench acceptance testing. A data review was held in March to review the bench acceptance test results and there are a couple of open items to resolve: 1) the IGSE {acronym??} was registering thermal infrared data when no data were being sent; and 2) photodiode measurements of the visible / near infrared calibration lamp had a downward trend. The results of this measurement were within spec, but the trend is being investigated further.

Lambros announced that current plans are to mechanically integrate ASTER onto the spacecraft in early May, with electrical integration completed by mid-May. The Direct Access System kick-off meeting was held recently to discuss plans for establishing a direct downlink site in Japan for capturing real-time ASTER data. The group is also considering capturing real-time MODIS data at that site.

Anne Kahle, ASTER co-principal investigator, presented an overview of the team's algorithm development status. The team has developed visible, near infrared, and shortwave infrared algorithms, adopting a look-up table approach based upon output from a radiative transfer code. Kahle said there is some concern in using Junge's aerosol size distribution and single scattering albedo. Based upon feedback from the ATBD review, ASTER has decided to change its look-up table to make better use of the inputs from the MISR and MODIS aerosol products. The goal is to maintain consistency with the aerosol parameters used to retrieve the inputs to the correction. However, strong emphasis will be place on developing ASTER-only atmospheric correction and adjacency effect correction algorithms.

Kahle reported that the thermal infrared atmospheric correction algorithm development is proceeding. Version 0 will be a basic implementation of the algorithm; Version 1.1 will incorporate default atmospheric models and data quality indicators on a pixel-by-pixel basis; and Version 2, which will be ready at launch, will incorporate interfaces to instrument profile data from other EOS sensor and from topographic databases.

Kahle announced that the temperature/emissivity separation algorithm is now complete and tested. The prototype of the daytime polar cloud mask is now available at JPL for product integration. She noted that the cloud mask runs with the Product Generation System (PGS) Toolkit on Landsat TM data.

Regarding ASTER science software, Version 1 is complete and was delivered to ESDIS in January 1997. Version 1.1 is in the final development stage and will be integrated in the ECS testbed beginning this June. Development of Version 2, the launch version, begins in June and is scheduled to be delivered in February 1998.

James Drummond, MOPITT principal investigator, reported that the instrument is presently at David Florida Laboratories, in Ottawa, undergoing EMC and vibration testing. Then it will be sent to the University of Toronto's calibration facility on April 15. Drummond stated that the test schedule is a concern in that it is marginal for effective instrument calibration. The remaining tests have been prioritized to maximize efficiency and the team is looking for ways to reduce the 45-day test schedule to fewer days. He stressed, however, that MOPITT's science objectives must be protected even under this heavy schedule pressure. He said the polarization test is proving to be a challenge, as is the spectral test. The team is attempting to speed up the field of view tests, which will take the longest time, but the scan mirror problems have slowed progress.

Drummond stated that MOPITT appears to be mostly "okay". There have been problems with the scan motors, but the problems were resolved. There were also problems with the port cover motors that have been resolved;

however, Drummond feels that this increases the risk on orbit and now is very reluctant to re-close those doors once opened. Jim Butler asked if those doors will be close during orbital maneuvers or left open. Drummond responded that the scan mirrors can be parked so that they are "looking" at the blackbody during maneuvers. Diner asked if there are thermal issues from leaving the covers open, especially concerning the system electronics should a maneuver bring the sun into the field of view. Drummond stated that if the mirrors are in park, he believes MOPITT can endure briefly pointing at the sun.

Jim Irons, {title??, code?}, reported on the status of Landsat-7 on behalf of Phil Sabelhaus, principal investigator. He told the group that Landsat-7 is a tri-agency group effort involving NASA, NOAA (for operations), and USGS (for data capture). Landsat-7 data will be archived and distributed from the EDC DAAC. Irons said that the platform is on schedule for a May 1998 launch—the schedule was reworked to accommodate late instrument delivery. An independent annual review and a Landsat Coordinating Group meeting were held in April at GSFC.

According to Irons, the Landsat-7 Project Office is supporting ESDIS' replan activities. He noted that full functionality of its data processing and distribution system will not be available until January 1999. However, when Landsat-7 becomes operational 90 days after launch, NOAA will archive and distribute Level 0R products; Level 1 products will be distributed to EOS science users in January 1999. Irons stated that Landsat-7 can capture 250 scenes per day and distribute to users a maximum of 100 Level 0R scenes per day. Kahle asked how much a scene will cost. Irons responded that at Level 0R a scene will cost up to $500. He noted that there is some discussion as to which agency owns the Level 1 data and who can set the price.

Spacecraft integration and testing of Landsat-7 has been underway since June 1996, with 46 of the 49 components already onboard. Some minor problems were experienced in the panchromatic band, which may be due to poor electrical cable workmanship. Hopefully, these problems have been resolved so that platform can be reassembled and calibration testing can begin.

Regarding the Landsat-7 ground system, Irons reported that the flight operations team is now staffed and in place. The mission operations review was completed in January and the ground station delivery to EDC is scheduled for May 1997.

Irons announced that the next Landsat-7 meeting is scheduled for April 15 -17 at Valley Forge. He said that plans are still to fly the platform on loose formation with EOS AM-1—within 15 to 60 minutes.

EOS Calibration Update

Jim Butler, EOS calibration scientist, reported that the second ASTER radiometric comparison was held in November 1996 in Japan, in which a series a ultrastable radiometers were used to make calibration measurements in the visible through the infrared. It was found that there was a 2 percent spread of preliminary visible/near infrared radiometric measurements, and a 5 percent spread of preliminary shortwave infrared radiometric measurements. A detailed article on this topic appears elsewhere in this issue (see ???, page ???). Butler also listed articles on previous radiometric comparisons dating back to February 1995. He announced that the second MODIS radiometric measurement comparison is tentatively scheduled for early June 1997.

Butler reported that the bidirectional reflectance distribution function (BRDF) measurement validation round-robin is underway. Participating facilities include NIST, JPL, U. of Arizona, Hughes SBRS, and NASA's GSFC. The idea is, at each of these agencies, to make BRDF measurements on a common set of diffuse targets at a number of visible, near infrared, and shortwave infrared wavelengths and over a range of incident and scatter angles.

Regarding EOS AM-1 proposed calibration attitude maneuvers (CAMs), Butler told the group that on Oct. 31, 1996, a letter was delivered to the EOS AM Project Office recommending the design and study of a pure pitch maneuver. This letter was delivered with the concurrence of the EOS AM-1 instrument principal investigators. No final decision has been made yet by the AM Project Office as to whether the pitch maneuver will be made and, if so, when.

Butler stated that the May 1996 vicarious calibration field campaign at Railroad Valley/Lunar Lake, NV, identified several areas that contribute to differences in participants' radiance and reflectance measurements. These areas included aerosol optical depth and size distribution, incident TSI {acronym?}, radiative transfer codes, atmospheric absorption, and surface reflectance. There will be additional campaigns in 1997 to compare reflectance measurements, visible/near infrared/shortwave infrared radiometers, and sun photometers.

Butler reported that Level 1b ATBD reviews were held in November and December 1996 for each of the EOS instruments. EOS Project Science Office Calibration personnel and NIST representatives participated in these panel and written reviews. Additionally, Butler plans to host a Calibration Panel Meeting July 8 - 10 at GSFC. Details on these and other calibration-related activities are available on the new Calibration Web page, at http://eospso.gsfc.nasa.gov/calibration/calpage.html.

EOS Validation Update

Dave Starr, EOS validation scientist, announced the location of his new validation page—http://eospso.gsfc.nasa.gov/validation/valpage.html—which he says contains useful validation information. He also reminded the group that the EOS Project Science Office also supports the HITRAN database for use in EOS algorithm development and science data validation; Starr encouraged the instrument teams to use this resource.

Starr presented an overview of the PROVE (PROtotype Validation Exercise) campaign to be conducted May 20 - 30 at the USDA-ARS/LTER Jornada Experimental Range in New Mexico. This campaign is being organized primarily by the MODIS Land Discipline Group. During PROVE, the NASA ER-2 will conduct two flights with AVIRIS, AirMISR, and the MODIS Airborne Simulator onboard.

Starr presented the validation schedules for the AM-1 and PM-1 timeframes. He noted that the post-ATBD revised validation plans and summary charts are due July 11, 1997. Selection of the NRA for investigators for AM-1 validation will occur in August. The final pre-launch validation plan is due from AM-1 teams in May 1998. Summary charts and draft plans for PM-1 validation are due Aug. 15, 1997. Starr announced that there will be a PM-1 Validation Workshop in September 1997.

Starr told the group that according to Jim Huning, {title? affiliation?}, the NASA C130 will be grounded permanently at the end of this year and that the third ER-2 will be grounded soon. Consequently, Starr is working with Huning to develop the concept of a national fleet of planes that are available to NASA for research missions. Starr showed the ER-2 flight schedule for fiscal years 97 - 99. He asked each team to submit any flight requests needed through FY98 as soon as possible so that flight planning may be done more efficiently. Specifically, he would like to know the scope of the flight plans for each group so that he can better characterize the “big picture” of EOS validation plans over the next several years.

Diner asked if the EOS instrument teams can respond to the Validation NRA. Starr responded that the NRA is open to anyone BUT the EOS instrument team principal investigators. He explained that the difficulty with teams proposing is that it would no longer be an open, fair competition. He also pointed out that each instrument team already has a funding mechanism in place to conduct validation efforts. He suggested that if a team feels it didn’t scope its validation budget correctly and now feels it need to do more activities, then it should address these concerns in its annual budget negotiations with the EOS AM-1 Project Science Office. He said the intent of the NRA is to bring more outside intellectual power into the EOS validation effort.

Digital Elevation Model (DEM) Update

Nevin Bryant, chair of the DEM Science Working Group, stated that the goals of his group are: 1) to insure that the required DEM datasets and their derivatives are available at launch in 1998; 2) to insure the progress toward and availability of DEM access software; and 3) to support other Mission to Planet Earth (MTPE) activities requiring DEM and auxiliary dataset information. Bryant stated that his group's approach is to identify the required DEM resolutions (1 km and 100 m); identify the DEM producers, production schedules, and data availability; and identify and perform trade studies to refine requirements, formats and derived DEM products for EOS instruments.

According to Bryant, EDC and MISR datasets containing DEM global coverage products at 1 km and 100 m were completed in 1996, and have been available to users since February 1997. The estimated accuracy of the two 1 km datasets is 41 m RMS. He expects them to be available in HDF-EOS GRID format by June 1997. Bryant noted that 35 percent of global land area will not be available at 100 m until after the year 2000.

Bryant stated that his group is currently working on six different trade studies. For instance, the Science Data Processing Toolkit calls for DEM datasets, so his group is working to identify the specific requirements. The DEM group is also evaluating the data access efficiency for raster tiling schemes. Bryant reported that the final DEM plan will be submitted to NASA in mid-1997 for signature.

Direct Broadcast Processing

William Campbell, of NASA GSFC Code 500, reported that Code 500 is working with U. of Maryland-Baltimore County, Clemson U., SW Louisiana U., and the U. of Hawaii to develop software and hardware for receiving direct broadcast data from MTPE platforms. The cooperative effort among these universities is an "open arrangement"—they must purchase and set up their own infrastructures. The prototype system has been up and working for the last 3 weeks and Campbell acknowledged that the system has minor glitches, but it works.

He announced that his group is working to develop the tools to acquire and process data, and produce products, in an intelligent, affordable way. EOS AM-1 will be transmitting with a 52 Mhz bandwidth. A cheap down converter was developed that will cover all of the X-band range. The that the entire system for processing data is run on a PC—everything from convolution and decoding, to demodulating and frame sychronization, to remote sensing decoding and depacketizing, to raw data ingest and storage. He noted that today, the EOS ground system costs between $400K and $600K without remote sensing decoding and depacketizing capabilities. In the Fall of 1997, the cost is expected to drop to about $150K, including decoding and depacketizing capabilities.

EOS AM-1 Science Outreach Coordinator
Kaufman introduced David Herring, newly-hired into the position of EOS AM-1 science outreach coordinator. Herring will work with the EOS AM Project Science Office, the EOS AM principal investigators, and the EOS AM interdisciplinary investigators to help communicate the science results of the EOS AM-1 mission to the general public. Specifically, Herring is currently working on an EOS AM-1 brochure and is helping to scope an exhibit on EOS that will reside in the "Looking at Earth" gallery of the Smithsonian Air & Space Museum.

Global Gridded Products
Robert Wolfe, MODIS Science Data Support Team member, reported on MODIS' plans to use a nested, integerized sinusoidal grid for producing Levels 2g through Level 4 gridded products. He noted there is also a desire from the polar community to develop a polar grid in which to produce the sea ice product at 1.25 km to match the AVHRR grid. The temporal grid resolution includes daily, 8 day, 16 day, monthly, 96 day, and yearly data.

Regarding the MODIS Land Group's climate modeling grid (CMG) products, Wolfe stated that 7 products will be produced at 1-degree resolution, as well as 0.25 and 0.5 degrees. The MODIS Ocean Group plans to use an integerized sinusoidal grid. The resolution is 4.6 km (2.5 arcmin) and the CMG is 1 degree. The temporal resolution is daily, weekly, and 3 weekly through Level 3 products; and yearly at Level 4. The Atmosphere Group plans to use an 8-day and equal angle grid (either integerized sinusoidal or Hammer-Atioff). Their CMG is 1 degree and the temporal resolution is daily and monthly. Wolfe presented the projected processing loads for each discipline group.

Diner presented a status report on MISR's global gridded products. He stated that the MISR Team is currently producing the second draft of their Level 3 ATBD. He noted that the earliest inclusion of products is in their Version 2.1 software. Diner described each Level 3 product in detail (refer to his presentation for specifics).

Barkstrom reported that all but one of CERES' gridded products are produced on a monthly average. There are four kinds of CERES gridded products: 1) ERBE-like (monthly average) in two formats so regional information is available on all fields or all regions within a particular field; 2) surface radiation budget (monthly average), including top-of-atmosphere and Earth surface fields; 3) synoptic product with the same spatial grid; and 4) full radiation fields and clouds at a monthly average. Barkstrom noted that the CERES data product catalog is available online at the CERES Web site.

John Gille reported that there are currently no official gridded products for MOPITT. Techniques to create validation and research products are being developed. Gille stated that there are six fields that MOPITT would grid, if it

chose to, using two methods. The first method is the Kalman / Cressman mapping method. Gille showed images illustrating the time effect that the setting sun has on atmospheric nitrogen oxide. The second gridding method is Advect and Update mapping. Under this method, the field is continuously advected and new measurements are combined with the field, according to variances. Using this method, however, map uncertainties grow with the time since the last data insertion.

Jim Stobie, of the Data Assimilation Office (DAO), reported that new gridded test data sets will be available by April 15 in the HDF-EOS GRID format. These data will also be COARDS {acronym??} compatible; however, if using the EOSDIS Toolkit, users won't see COARDS metadata and if using the FERRET Toolkit, users won't see GRADS metadata.

Stobie stated that the DAO will provide hourly surface data every 3 hours, and 3-hourly upper air data every 6 hours. The sample data will be a 1-month sample from August 1996 in a 2-by-2.5 lat-long grid. This data set will not be moved to a 1 km grid until a year after launch; available at 36 pressure levels. File specifications on this data set will be available soon. Stobie listed contact information for DAO representatives for each EOS instrument team.

EOSDIS Emergency Backup Update

Irons reported that the Landsat-7 Team is developing a new antenna at the Landsat Ground Station, from which data will be sent to the Landsat Processing System to produce Level 0R data in HDF format—this is reformatted raw data with no corrections or resampling. From there, the data will be sent to ECS. After launch, the operations of the processing system will be managed and paid for by NOAA through EDC, whereas ECS will be managed and paid for by ESDIS.

But, what happens if there is no ECS at launch? Irons stated that the first priority is to not drop any data. In an emergency system, there would be a tape system developed to capture data and create a back up tape archive for eventual transfer of data to ECS when it finally does come on line. During the orbital checkout period, an image assessment system will be established for ingesting Level 0R data. This system will have the capacity to archive 250 scenes per day and output up to 35 scenes per day.

Regarding MODIS' emergency backup plans, Ed Masuoka (MODIS Science Data Support Team Leader) told the group that the MODIS Science Team is providing the software for the core system and SDST is putting the processing and storage system together. The GSFC DAAC will handle distribution and ancillary data. The goal of the MODIS backup plan is to develop a computing system to support quality assurance, validation, and early science development of the algorithms.

Masuoka reported that on March 9, SDST made a demonstration to ESDIS Project personnel the processing of MODIS products using the SeaWiFS processing framework. Since then, tiling has been added for processing Level 2G and Level 3 products. Current SDST activities include incorporating the Version 1 MODIS science software into the emergency backup processing framework, developing post-launch visualization tools, and prioritizing resource usage in the back up system. Data are now being collected over validation sites that will be used to tune the algorithms. After launch, initial emphasis will be on studying ocean / aerosol effects, ocean surface temperature, vegetation index availability, geolocation accuracy, and the instrument's 250 m registration.

Graham Bothwell, of the MISR Team, reported that the primary goals of MISR's emergency backup plan is for the MISR SCF to support all calibration / validation work, as well as all the early mission basic science goals. The DAAC will ingest, archive, distribute and possibly provide some additional processing of Level 0 MISR data. It is possible that these data could be processed through Level 3 at the DAAC; however, details and potential capacity are yet to be determined. Bothwell said he is concerned that there may be some difficulty in obtaining appropriate new staff at JPL at short notice. Also, MISR is relying on the goodwill of the DAAC to make existing resources available, which adds risk in the situation where the DAAC encounters capacity, throughput, or staffing limitations.

Barkstrom presented an overview of CERES' emergency backup plans. He stated that CERES differs from other EOS instruments in that when it ran into the problem of producing a different release A that what is being produced for TRMM, it had to put together a plan for production with the DAAC. Consequently, a slightly modified proposal was produced, and accepted by ESDIS, for a computer system to extend the TRMM system being designed. The major changes for AM-1 is more jobs and more data files are being produced. He noted that AM-1 will provide data over the polar regions, that TRMM can't provide.

Moshe Pniel presented an overview of the ASTER emergency plan, to be jointly executed by JPL ASTER and the EDC DAAC. The EDC DAAC will ingest Level 1 data tapes from Japan, create a database from Level 1 metadata to support rudimentary search and order capabilities, and distribute a small amount of data to the ASTER SCF. The ASTER SCF will select a limited set of Level 1 data, get the appropriate external data sets needed for Level 2 processing, produce Level 2 data, and distribute Level 2 scenes to ASTER principal investigators. Pniel stated that Japan will initially send two scenes per day and will eventually ramp up to 150 per day; four full Level 2 scenes per week will be produced at the SCF.

The MOPITT emergency backup plan was presented by Paul Bailey, of NCAR. He noted that MOPITT has only two at-launch standard products and three experimental products with relatively small computational resource requirements. Instrument activation and checkout will take 3 months, so the team's requirements for DAAC processing are quite low. Algorithm checkout will be done 3 to 5 months after launch with low DAAC utilization due to the need for high interactivity. MOPITT's approach will be to build on the SCF science data processing software testbed, which will be in place to support activation and checkout. The capability to capture and manage appropriate metadata during product generation will be added to this software. Bailey said MOPITT will rely on the LaRC DAAC for distribution to the user community.

In summary, Kaufman stated that the team's emergency plans are now defined and in place. So, even if ECS is not ready at launch, there will be some capacity for processing and distributing AM-1 data. The emergency systems will phase out as EOSDIS comes on line and they become redundant.

SWAMP Evaluation of EOSDIS Testing

Kaufman stated that the SWAMP group must evaluate the EOSDIS test plan and insure that there is an adequate supply of test data to EOSDIS. Specifically, the SWAMP must evaluate the test results, report those results, and recommend actions to ESDIS.

Skip Reber told the group that the EOSDIS test will be demonstrations of some degree of usability and functionality of the system. These demonstrations will be held in May 1997, and again in August, and will include EOSDIS' ability to supply PGE's and test data. The test will be a demonstration of the basic push functionality of ECS using selected instrument teams' data and PGEs.

Pniel announced that the two points of contact for the instrument teams are Skip Reber and Joe {lastname??} from ECS—they are responsible for obtaining test data. Each instrument team should work with these two individuals to make sure that the tests that are run make sense.

Data System Working Group Report

Reber reported that this group's only activity was a workshop to provide mutual understanding of how to implement metadata in preparation for the launch of Landsat-7, EOS AM-1, and SAGE. He proffered that metadata refers to the information you need in order to get data out of the system in a useful and meaningful way. Users' ability to retrieve data depends upon the metadata; however, there is some confusion and misinterpretation about the term. Initially, 287 attributes were being suggested as inputs for metadata, which was an intimidating number.

Reber said that, as a result of the workshop, metadata will be divided into four broad categories: mandatory, science critical, science optional, and product-specific attributes. He stated that after launch there will be opportunity to insert new metadata items, but that opportunity decreases with time.

EOSDIS Update

Rick Obenschain, ESDIS project manager, presented an update on the status of EOSDIS, including a summary of the current system requirements. He raised the question, What happens if EOSDIS' core capabilities are not available at launch? Obenschain acknowledged that the instrument teams now have their emergency backup plans, which were initiated on March 17. But ESDIS also decided, while developing its software release B.0 capabilities, to set a milestone that it feels it can reach and that will provide basic EOSDIS functionality—called B.0 (prime). Release B.0' will have a critical subset of the capabilities of B.0, which in turn will be an incremental build toward B.1.

Obenschain recognized that there is general concern that ESDIS hasn't developed an architecture that will adequately support the EOS instrument teams through the PM-1 era. So, ESDIS has proposed four options for the EOSDIS architecture which a committee of representatives from the user community, instrument teams, DAACs, ESSAACs, and the NRC can evaluate and select from. The idea is to evaluate all options in an intelligent manner and then build the best system possible. (Refer to Obenschain's presentation for details on each option.)

Obenschain announced that within 9 months ESDIS must deliver release B.0, and so B.0' must be built in the interim. Release B.0 refers to the required functionality within EOSDIS for the period of launch through 6 months after launch. He stated that ESDIS can't change the basic architecture of release A, but it can add software demonstrations that will provide confidence in the system. The first demonstration will be in May 1997. A second demonstration is scheduled for August 1997. Obenschain said that ESDIS is currently on schedule to deliver the release B test bed, as well as to conduct the demos. However, if in August it appears that ESDIS cannot provide the B.0 capability at launch, then ESDIS will decide on a new course and will then increase the funding for the emergency backup plans.

Calibration Attitude Maneuvers

Joe Bolek, of the EOS AM-1 Project Office, presented an overview of the two calibration attitude maneuvers (CAMs) being studied. One CAM being considered is a multiple rate pitch that allows for deep space viewing, as well as a slower rate for viewing the moon. The second is a constant pitch rate that views the moon and deep space at the same rate. Bolek then listed the specific requirements for the maneuver.

Grady told the group that Chris Scolese, EOS Project Manager, wants the capability to do the maneuver but has not yet committed to when he would do it. So, the maneuver is not in the spacecraft baseline plan yet. Murphy pointed out that the CAM must be planned before the early validation stage and cannot be delayed because a lot of data sets will be negatively impacted. Bill Barnes, MODIS instrument scientist, added that he would like to see the CAM done within the first 60 days after launch. He proffered that this is critical to MODIS' calibration and should already be part of the baseline plan. Kaufman pointed out that a memo explaining the need for the CAM was already sent to the EOS Project Office; he asked Grady when a response will be forthcoming. Grady didn't know, stating that the EOS Project Office will continue to go forward with its planning and analyses.

Ground Control Points

Bryan Bailey, project scientist of the Land Processes DAAC, announced that his team held its initial meeting in October 1996, at which they discussed requirements for ground control points (GCPs) and instrument team preferences. He noted that ASTER and Landsat-7, and MODIS and MISR, are natural pairings in their GCP requirements.

Bailey showed some sample images—such as the Salton Sea in California, and a road grid in northwest Iowa farmland—which are candidates for "positional information image chips." He said the idea is to identify GCP's that can be shared by EOS instruments to reduce duplication of effort and cost in establishing them. Bailey briefly listed some candidate positional information sources.

Bailey reported that the remaining task facing his group are to complete the identification and selection of physical ground features, finish identifying and obtain the best imagery for creating image chips, finish identifying and obtain the best positional information for GCPs, and then create the GCP chips.

Policy for Algorithm Modification

Kaufman stated that it is not clear when algorithms will be modified and when reprocessing will occur. He feels that a policy should be implemented to govern these two things. Kaufman suggested that in the first year after launch, the PIs can change their algorithms routinely, but they will be encourage not to change them. Also, quality control parameters can be developed to indicate whether an algorithm was not changed, was modified slightly, or changed significantly prohibiting a time series. Reber took an action to summarize the policy whereby PIs record changes in their algorithms. He asked for the PIs to send him their recommendations on how changes should be made and when a freeze should be implemented.

EOS AM-2 Planning

Ray Taylor, of the EOS Project Office, presented an overview of options for the EOS AM-2 payload. Taylor assumes that Landsat and EOS AM missions will merge after Landsat-7 and EOS AM-1, incorporating lessons learned from those missions. He reported that the baseline plan is to launch AM-2 in 2004 with a measurement complement that encompasses the measurements of MODIS, MISR, ETM+, CERES, and EOSP. The idea is to incorporate new and advanced technologies for improved system performance while reducing the weight and volume of the spacecraft and continuing the MTPE science research objectives.

Taylor said there are four options for EOS AM-2: 1) fly copies of existing instruments and spacecraft, 2) fly evolutionary instruments and spacecraft, 3) develop completely new designs, and 4) rely on other providers. Taylor recommends option #3.

He said that AM-2 will be significantly smaller than AM-1, and will go from using an ATLAS rocket to a TAURUS. He is also exploring possibilities for formation flying with other platforms. Specifically, Taylor is considering grouping three spacecraft and is developing requirements for navigation and geolocation knowledge for position and attitude knowledge. He said the goal is to get within 0.10 pixel pointing knowledge; to do so, the spacecraft must be within 3.5 minutes of one another in their overpass times. He added that for cloud studies, the spacecraft must be within 1 minute of one another, so that requirement would drive the formation plans.

Next SWAMP Meeting and Action Item Review

The next SWAMP Meeting was tentatively scheduled for the second week in September 1997. Meanwhile, the following action items were assigned to the person(s) indicated.

1. Re: *Special Issue on EOS AM-1*. All EOS PIs should submit input on ideas for articles on early science results by June 1, 1997. "Early" means between 40 and 90 days after launch. Please send titles and a few sentences of explanation on your story idea.
2. Re: *Converting ATBDs to a publishable format*, either for a journal such as JGR or perhaps on CD ROM. All PIs who are authors of ATBDs should forward their ideas on this action to Skip Reber by {when?}.
3. Re: *Calibration Attitude Maneuvers*. The EOS Project Office must develop a timeline for providing an answer to the instrument teams on when the CAM will be baselined and when, after launch, it will be carried out.
4. Re: *Post launch algorithm changes*. Skip Reber will summarize the policies governing how and when PIs may change their algorithms. His recommendations should be circulated for review by {when?}. All SWAMP PIs should submit their recommendations to Skip by {when?}.